DEVELOPMENT OF RAINFALL TEMPORAL PATERN IN UNIVERSITI MALAYSIA PAHANG

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at University Malaysia Pahang or any other institutions.

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ABSTRAK

Cuaca dan iklim adalah berkaitan tetapi berbeza dalam masa perubahan dan ramalan. Cuaca terdiri daripada variasi jangka pendek seperti suhu tekanan udara dan kelembapan hujan. Oleh kerana perubahan yang tidak dapat diramalkan, ramalan cuaca terhad pada hari-hari sahaja. Rutin harian kami dipengaruhi oleh keadaan cuaca; pemerhatian keadaan cuaca dapat membantu dalam memahami aktiviti. Adalah penting untuk memerhatikan dan mengkaji perubahan cuaca di kawasan tertentu dengan menggunakan mana-mana ciptaan yang kita ada sekarang. Perubahan dan corak cuaca di Gambang dan kawasan setempat boleh dikaji dengan menjalankan analisa data hidrologi dari Jabatan Pengairan dan Saliran (JPS). Pengedaran hujan telah lama diteliti oleh penganalisis untuk membantu inovasi semasa dan kerja-kerja kejuruteraan. Salah satu siasatan adalah untuk mewujudkan RTP. Terdapat beberapa pendekatan untuk membuat RTP, contohnya, menggunakan Kaedah Variabel Purata (AVM), Perkhidmatan Pemuliharaan Tanah (SCS), Kaedah Masa Huff dan Kaedah Segitiga. Berdasarkan objektif kajian ini, untuk menubuhkan Corak Temporal Hujan (RTP) untuk Universiti Malaysia Pahang, Gambang dengan menggunakan kaedah Huff Time Distribution Method (HTDM) dan kaedah Institut Penyelidikan Sumber Air (WRRI) untuk menganalisis data yang dikumpulkan. Data diperhatikan dan dibahagikan kepada dua peristiwa iaitu 60 minit dan 120 minit peristiwa hujan. Dari analisis data, ringkasan kejadian hujan yang berlaku di sekitar Universiti Malaysia Pahang telah dibuat. Di stesen id 3731018, nama JKR Gambang, terdapat 17 kejadian curah hujan yang berlaku dalam tempoh 60 minit, 11 lagi peristiwa hujan berlaku dalam masa 120 minit. Sebanyak 28 peristiwa hujan direkodkan dari tahun 2013 hingga 2018. Kemudian, data yang diperhatikan dibahagikan kepada empat kuartil yang sama. Data tersebut dianalisis mengikut setiap kaedah dan hasilnya adalah dalam bentuk peratusan. Untuk tujuan kajian seterusnya, hasil daripada kedua-dua kaedah tersebut dibandingkan. Semua empat hasil keluk diwakili setiap kuartil masing-masing, pertama, kedua, ketiga dan keempat. Untuk membandingkan hasil dari kedua-dua kaedah, perbezaannya dikira dari segi peratusan yang diplotkan. Corak Temporal Hujan digambarkan dengan menggunakan Kaedah Pengagihan Masa Huff dan kaedah Institut Penyelidikan Sumber Air berdasarkan penganalisaan data. Perbezaan dalam setiap grafik yang diplot berubah dari kira-kira 17.31% kepada 74.08%.

ABSTRACT

Weather and climate are related but different in time of changes and prediction. Weather consists of short-term variations such as precipitation air pressure temperature and humidity. Due to unpredictable changes, weather predictability is limited to days only. Our daily routine is affected by weather conditions; observation of weather conditions can help in understanding the activity. It is crucial to observe and study the weather changes in that particular area by using any of the invention that we have now. The changes and pattern of weather at Gambang and the local area can be studied by running an analyzation of hydrological data from Department of Irrigation and Drainage (DID). Rainfall distribution has for some time been researched by analyst to help with current innovations and engineering works. One of the investigations is to create RTP. There are a couple of approaches to create RTP, for example, utilizing Average Variability Method (AVM), Soil Conservation Services (SCS), Huff Time Method and Triangular Method. Based on this study objective, to establish Rainfall Temporal Pattern (RTP) for Universiti Malaysia Pahang, Gambang by using method of Huff Time Distribution Method (HTDM) and Water Resources Research Institute method (WRRI) to analyze the data collected. The data were observed and divided into two events which is for 60 minutes and 120 minutes rainfall event. From the data analysis, the summary of rainfall event happening around Universiti Malaysia Pahang was concluded. At station id of 3731018, name of JKR Gambang, there are 17 rainfall events that happening in 60 minutes time period, another 11 rainfall events happened in 120 minutes time period. A total of 28 precipitation events were recorded from year 2013 until 2018. Then, the observed data were divided into four equal quartile. The data were analyze according to each method and the result are in term of percentage. For the next study objective, the result from both method were compared. All of the four curve produce are represented each quartile which is first, second, third and fourth respectively. In order to compare the result from both methods, the difference are calculated in term of percentage are plotted. Rainfall Temporal Pattern are plotted by using Huff Time Distribution Method and Water Resources Research Institute method based on the analyzation of the data. The differences in each graph plotted varies from about 17.31% to 74.08%.

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LIST OF SYMBOLS

P(t)	Depth of precipitation of time
P	Total depth of precipitation
$\Delta\tau$	Time based
	Dimensionless fraction
H	Height of triangle
I	Rainfall Intensity
%	Percentage
%cum	Cumulative of Percentage
Ave	Average

LIST OF ABBREVIATIONS

Met Malaysia	Jabatan Meteorologi Malaysia
MSMA2	Manual Sistem Saliran Air Malaysia Second Edition
HTDM	Huff Time Distribution Method
WRRI	Water Resources Research Institute
RTP	Rainfall temporal pattern
DID	Department of Irrigation and Drainage
AVM	Average Variability Method
SCS	Soil Conservation Service
JPS	Jabatan Pengairan dan Saliran
JKR	Jabatan Kerja Raya

CHAPTER 1

INTRODUCTION

1.1 Background Study

Weather and climate are related but different in time of changes and prediction. Weather consists of short-term variations such as precipitation air pressure temperature and humidity. Due to unpredictable changes, weather predictability is limited to days only.

Climate is the statistic of weather that counted over months or years. It also includes probabilities of event that happening on Earth. Climate is generated by climate system, which has five components that is atmosphere, hydrosphere, cryosphere, lithosphere and biosphere.

The climate of specific place is affected by latitude, altitude and terrain. Most common variables are temperature and precipitation. In the other hand, weather and climate are factors which decide how a society develop in a specific place. Weather generally shows the specific condition for short period, for example, hours or days while climate shows the characteristic changes to a place over a long period. Temperature, precipitation, humidity and wind are the included in weather while climate shows the overall conditions of a particular places in a long period of time.

Weather information are crucial in our everyday life. The information gathered, for example, precipitation and temperature can be utilized to be a step-by-step care against regular catastrophe, for example, flood and drought. The main worry with the climate change is the efficiency and accuracy. Unpredictable weather such as rain and flood can cause to danger of safety and health, increasing the danger of recordable injuries and making unsafe working conditions. Higher temperatures can cause heat pressure and lead to heat stroke and even death. However even with planning, the greatest danger is

unpredictability. As temperatures rise, higher temperatures make longer curing process, which increase the time and skyrockets costs (Grant, 2018).

Another worry for people that doing external work such as construction project is the impact climate change on building materials and current structures. Unpredictable changes in temperatures cause materials like brick and wood to rot and break quicker. People will most likely be unable to control the climate change, however climate can be adapted and climate change is not all bad for the construction industry. Every day, solutions and improvements are underway to help to solve the problem of weather changes that are happening right now. From there, the improvisation of the quality of raw materials or processes that have been used in today's construction. Climate cannot be controlled, yet there still a way that can be taken as a precaution step.

A weather station is an equipment that collect information identified with the weather and condition using a wide range of sensors. Nowadays, weather forecast can be collected with many way and equipment. It depends on the individuals to choose what are the most efficient ways and equipment to be rely on. For example, satellite forecast, automated rain gauge or just a manual rain gauge that can be made by self-innovation. The accuracy for all these equipment are clearly not the same and this study are made to provide information for upcoming research.

1.2 Problem Statement

Daily routine is affected by weather conditions; observation of weather conditions can help in understanding the activity. It is crucial to observe and study the weather changes in that particular area by using any of the invention that we have now. The changes and pattern of weather at Gambang and the local area can be studied by making analyzation of hydrological data from Department of Irrigation and Drainage (DID).

1.3 Research Objective

The objectives of this study are as following:

- To identify amount of rainfall at Kolej Kediaman 2 at UMP Gambang.
- To establish Rainfall Temporal Pattern for UMP Gambang using WRRI and Huff Time Distribution Method.
- To compare the result of both method.

1.4 Scopes of study

Some of the scope of the study should be conducted to ensure that the objectives are met.

This study will be conducted at Kolej Kediaman 2 at Universiti Malaysia Pahang, Gambang. The data from Department of Irrigation and Drainage were collected for the station of Jabatan Kerja Raya Gambang. Then, the data will be analyse by using Huff Time Distribution Method (HTDM) and Water Resources Research Institute method (WRRI).

The study use the 5 minutes interval of rainfall event from 2013 to 2018. Total of 5 years of data were then analysed. The collected data were sorted into 60 and 120 minutes rainfall event. Based on the objective, to develop Rainfall Temporal Pattern by using HTDM and WRRI, the data were calculated.

The result from the data analysation were used to develop RTP for the selected area which is UMP Gambang. Lastly, for the objective of comparing the result from both method, the result were concluded in term of percentage difference. From the result, the objective can be achieved.

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